

## CLAIMS

1. In a circuit card stripline Fast Faraday cup system for measuring the structure of a charged particle beam, the system including
  - a first groundplane;
  - a first dielectric bonded to the first groundplane;
  - a conductor bonded to the first dielectric, a portion of the conductor used as a beam target;
  - a second dielectric bonded to the conductor by means of a bonding dielectric, the bonding dielectric having the same dielectric constant as the first dielectric;
  - a second groundplane bonded to the second dielectric, the second dielectric and the second groundplane having a channel for the unimpeded passage of the beam to the beam target; and
  - a high bandwidth digitizer connected to the conductor, the high bandwidth digitizer electrodynamically matched to the conductor and the beam target;

the system additionally comprising:

the first groundplane connected to the second groundplane by electroplated stitching to prevent the occurrence of a resonance condition between the first and second groundplanes.
2. The system of claim 1 further including a bias conducting ring located at the channel in the second groundplane, and a means for applying a voltage to the bias conducting ring.
3. The system of claim 1 wherein the conductor is connected to the high bandwidth digitizer by means of a single edge launch connector.
4. The system of claim 1 wherein the conductor is connected to the high bandwidth digitizer by means of two edge launch connectors.

5. The system of claim 1 wherein the high bandwidth digitizer is a sampling oscilloscope
6. The system of claim 1 additionally including a vector network analyzer, the vector network analyzer capable of processing a time-delayed, amplified charged-particle-beam-induced signal from the Fast Faraday cup including the steps of
  - measuring the frequency response of the cabling, vacuum interconnects, and amplifier between the Fast Faraday cup and the high bandwidth digitizer;
  - Fourier transforming the digitized signal from the high bandwidth digitizer;
  - multiplying the frequency response, Fourier transformed digitized signal, and a window function; and
  - inverse Fourier transforming the multiplied frequency response, Fourier transformed digitized signal and window function result to obtain the calibrated time domain charge distribution in the Faraday cup.